

Moles and Shrews Study Guide

Helpful Hints:

This study guide will focus on the moles and shrews of Illinois. The Eco-Meet test that accompanies this packet may contain questions that are multiple choice, true/false, fill in the blank, matching, and/or short answer. There may be diagrams that you will be asked to label or a section for identifying local mole and shrew species. Pay close attention to bold words, diagrams, and charts. Questions come directly from the study guide.

Classification

Contrary to popular belief, moles and shrews are not rodents. They belong to the order **Eulipotyphla** (meaning “truly fat and blind”), which also contains hedgehogs. Despite their order name, these small mammals are not blind, but they do have poor eyesight. Within this order, moles belong to the Family **Talpidae**, and shrews belong to the Family **Soricidae**. There are 42 species of moles and 300 species of shrews. There is only one species of mole found in Illinois – the **Eastern Mole**. Illinois has 6 species of shrews, with the **Northern Short-Tailed Shrew** and **Southern Short-Tailed Shrew** being the most common.

Kingdom	Kingdom
Animalia	Animalia
Phylum	Phylum
Chordata	Chordata
Class	Class
Mammalia	Mammalia
Order	Order
Eulipotyphla	Eulipotyphla
Family	Family
Soricidae (Shrews)	Talpidae (Moles)

What is a Mole?

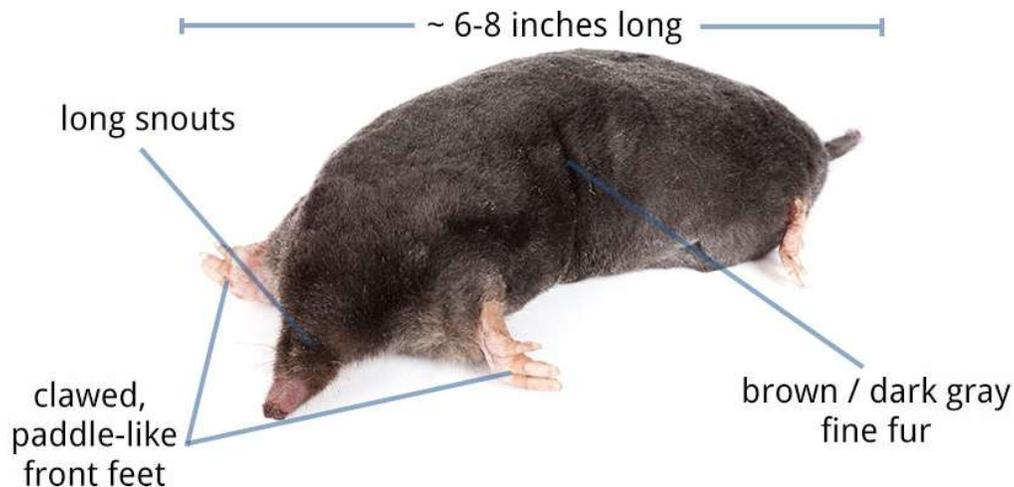
Moles are small, solitary mammals averaging about 6-8 inches long and 2.5 ounces in weight. They only live about 3 years. Moles possess many external features that allow them to thrive underground. They have cylindrical bodies with short, directionless fur and no external ears, so they can pass through burrows with little resistance. The forelimbs of moles are short and strong, with clawed, paddle-like paws that are permanently turned outward to aid in the excavation of burrows. The front paws each have an extra thumb called a **prepollux** that aids in digging. In favorable conditions, moles can tunnel 18 feet per hour.



Since they are primarily underground, eyesight is not their strongest sense. Moles are not blind; they have tiny eyes with fused eyelids that are hidden under fur that only allow to sense light and movement. They mostly rely on their sense of touch, smell, and hearing. Moles have a long snout which is quite sensitive and can smell in stereo, which means they can immediately detect odors and the direction at which they are traveling.

As underground burrows are relatively oxygen-poor compared to the air above ground, moles are more efficient at oxygen uptake than other mammals. Moles have a specialized type of **hemoglobin**, a molecule in blood that binds to oxygen, and are able to extract higher amounts of oxygen from their surroundings.

MOLE ANATOMY



Diet and Dentition

Burrowing through soil requires a tremendous amount of energy, and moles typically eat about 75% of their body weight each day. They eat at frequent intervals. Moles are primarily **insectivores** that prefer a diet of earthworms, insects, grubs, centipedes, millipedes, slugs, snails, and spiders. Moles have a toxin in their saliva that paralyzes their prey, allowing them to save the meal for later. Moles have also been known to eat various nuts, which provide much needed energy.

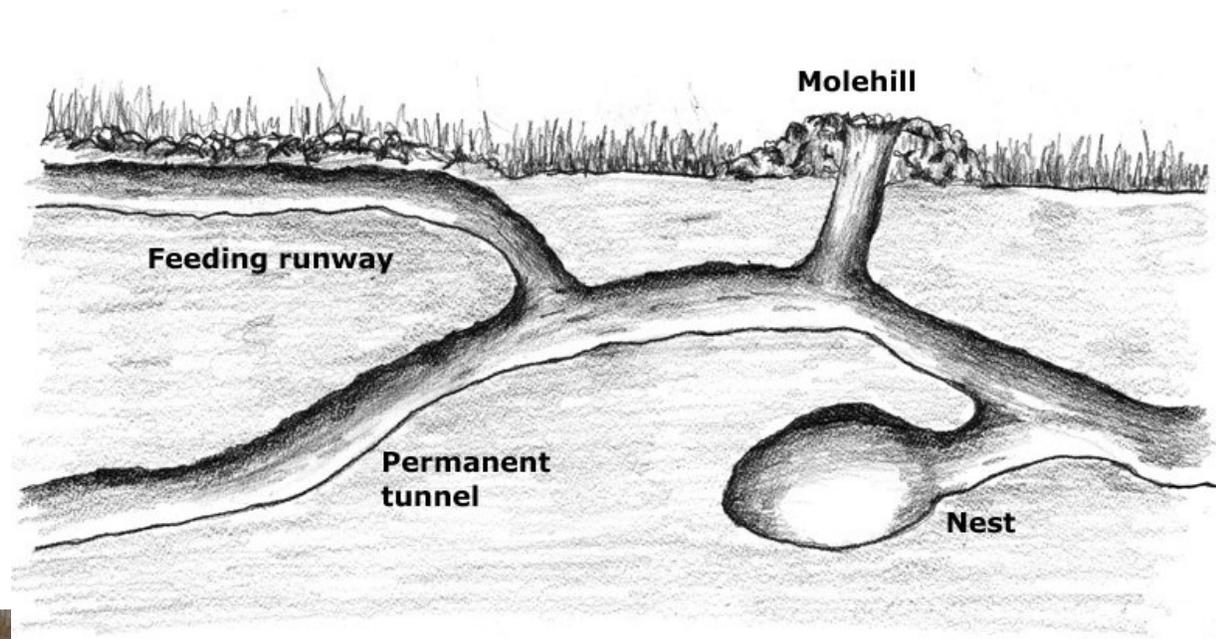
The jaw of the mole is long with 44 **heterodont** teeth, which means that there are different teeth along the jaw specialized for different tasks. The cheek teeth are **dilambdodont**, containing a pair of lambda-shaped (“Λ”) ridges on the chewing surface.



Subterranean Lifestyle

Moles are **fossorial**, meaning they are burrowing animals. They are adapted to live a **subterranean** lifestyle, meaning that the vast majority of their time is spent underground. Rather than having fur that lays flat and points toward the tail like most mammals, eastern moles have dense fur that sticks straight up. This prevents soil from becoming trapped in their coats when they back up through a tunnel. Moles dig vast underground tunnels for nesting, shelter, and finding food. However, they can be considered pests due to their molehills and tunneling damaging yards and gardens.

Looking at the diagram on the next page, moles dig temporary tunnels and permanent tunnels. The temporary tunnels are right below the surface of the ground. These temporary tunnels are referred to as the feeding runway where moles forage for food, creating visible ridges on the surface. Permanent tunnels are 1-2 feet deep and are used for protection and nesting. When digging, moles push out excess dirt and it creates mounds outside their tunnel, creating a molehill. On average, a mole's home range is 1.8 acres. To put that size into perspective, one acre is 43,560 sq. ft., just shy of the size of a football field.



Pictured to the left is a real picture of mole tunnels. Since they are close to the surface they are likely feeding runways.

Predators

Despite living underground, moles are still susceptible to predation. Weasels, coyotes, skunks, badgers, foxes, cats, dogs, and even snakes will readily consume moles. Humans who dislike moles tearing up their yard is another threat to moles. On the rare occasion that a mole ventures above ground, they are vulnerable to birds of prey such as hawks and owls.

Fun Facts

- Male moles are called “boars” and female moles are called “sows.”
- Moles and shrews do not hibernate – they are active all winter long.
- Moles are found throughout the world except Antarctica and South America.
- A mole’s favorite meal is earth worms. A single mole can eat 40 pounds of worms a year!
- The **Star-Nosed Mole** gets its name from its star-shaped touch organ on its snout (see picture to right). It is the most sensitive touch organ of any mammal. It has more than 100,000 nerve fibers – that is five times the number in the human hand!
- Baby moles are called pups, and after 33 days they leave the nest and at six weeks they leave mom and the tunnels all together to find territory of their own.
- The Naked Mole Rat is not a mole at all, but rather a rodent.



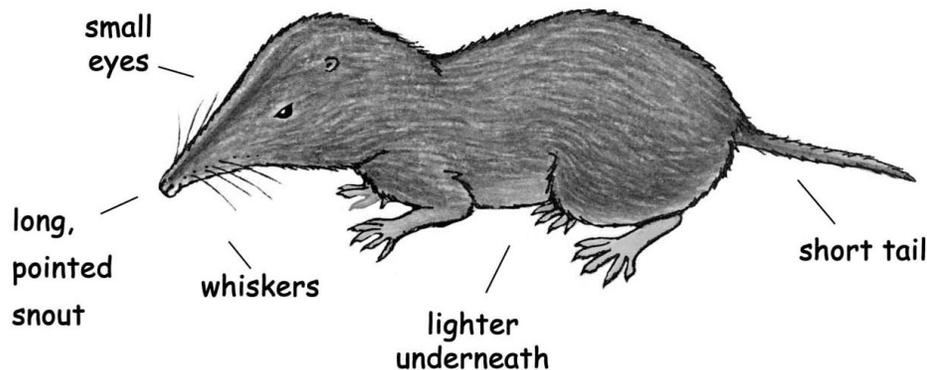
Identifying Illinois Mole Species

Distinguishing Characteristics	Species
<ul style="list-style-type: none">• Avg. Length: 4-7 inches• Color(s): gray on top and white on underside• Small hairless tail about 1-1.5 inches long• Feet and snout are pale pink• Cone-shaped nose with 0.5 inch nostrils• No external ears	 <p data-bbox="1102 1755 1282 1785">Eastern Mole</p>

What is a Shrew?

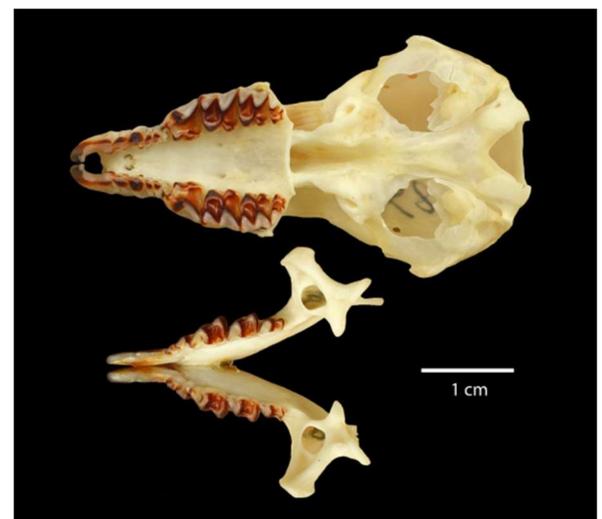
A shrew is a small mammal with a similar appearance to a mouse but smaller. Like the mole, they have long snouts, short legs, and long tails. Shrews only live about one year in the wild. They inhabit a wide array of habitats across the globe – marshes, grasslands, woodlands, and more. Regardless of the species, all shrews share one characteristic – their red-tipped teeth.

These solitary creatures are primarily **nocturnal** meaning they are active at night, but they are known to be active during the day as well. Shrews are often found scurrying on the ground in leaf litter or in burrows. As mentioned above, this order of mammals has poor eyesight, so shrews heavily rely on their senses of smell, touch, and hearing. To help them navigate in the dark, researchers have found that some shrews use **echolocation**. Echolocation is the use of reflected sound waves (echoes) to locate and identify objects; it is commonly known with bats and dolphins. Unlike other animals that use echolocation, shrews use ultrasonic squeaks for close-range spatial arrangement, that is they only use it to navigate their territory, not to find food.



Diet and Dentition

Similar to moles, shrews have a very fast **metabolism**, the breakdown of food into energy, so they can eat 100% or more of their body weight a day. This means they spend the majority of their time foraging for food. A shrew's diet mostly consists of earthworms, snails, slugs, insects, and other invertebrates. However, they have also been known to forage for seeds, berries, and other plant parts. To slow down teeth wear, shrews' teeth contain a high content of iron to make them extra strong but also makes them red-tipped. Shrews have 26-32 heterodont teeth, and the upper molars are dilambdodont.



Predators

Due to their small size, shrews face many predators. Including but not limited to: owls, hawks, weasels, snakes, and coyotes.

To avoid predation, shrews have two defenses. The first, is they have scent glands that can release a foul taste when it feels threatened. The second is they have salivary glands that produce venom that immobilizes prey. Shrews can easily take on animals bigger than they are. Check out the video link below to watch a shrew take on a garter snake. Some shrews have enough venom to sedate 200 mice.

Fun Facts

- In the winter when food is scarce, shrews literally shrink their bodies – including their skulls and brain! They shrink about 15-20% to reduce their food requirements to survive through the winter.
- Saliva from the Northern **short-tailed shrew has been studied to use the venom to fight cancer cells in humans.**
- **Shrews frighten easily and will jump or even faint if startled.**
- The American Pygmy Shrew is the smallest American mammal – its weight is similar to a dime!
- While shrews have a short life span, they reproduce rapidly. A single shrew can reproduce up to 10 times a year.
- Shrews have a very fast heartrate, averaging 800 beats per minute, through some species of shrews have faster rates than that!
- Here is a quick three minute video on shrews about their unique characteristics and hunting skills.

https://www.youtube.com/watch?time_continue=148&v=NNowlueg4H4



Identifying Illinois Mole and Shrew Species

Distinguishing Characteristics	Appearance
<ul style="list-style-type: none"> • Avg. Total Length: 3.9" • Color(s): brown/gray on top and gray/white underside • Arched brow • Rounded forehead • Has the largest range of any North American Shrew 	 <p data-bbox="1000 888 1203 915">Masked Shrew</p>
<ul style="list-style-type: none"> • Avg. Total Length: 3 – 4.25" • Color(s): reddish-brown on top and grayish underside • Slightly smaller and more red than Masked Shrew • Larger than the American Pygmy Shrew • Longer tail than Northern and Southern Short tailed shrew 	 <p data-bbox="959 1375 1239 1402">Southeastern Shrew</p>
<ul style="list-style-type: none"> • Avg. Total Length: 3 – 3.5" • Color(s): reddish-brown on top and grayish underside • Smallest shrew 	

	American Pygmy Shrew
<ul style="list-style-type: none"> • Avg. Total Length: 3.5 – 5.5” • Color(s): slate gray on top and slightly paler underside • Largest shrew in IL • Short tail • Can be distinguished from Southern Short-Tailed by range or genetics 	 <p data-bbox="906 772 1295 810" style="text-align: center;">Northern Short-tailed Shrew</p>
<ul style="list-style-type: none"> • Avg. Total Length: 3.5 – 5.5” • Color(s): slate gray on top and light gray underside • Short tail • Can be distinguished from Northern Short-Tailed by range or genetics 	 <p data-bbox="906 1239 1295 1276" style="text-align: center;">Southern Short-tailed Shrew</p>
<ul style="list-style-type: none"> • Avg. Total Length: 2.75-3.25” • Color(s): Grayish Brown/Dark Brown on top and slightly paler underside • Smaller than Northern and Southern Short-tailed shrews • Shorter tail than Southeastern Shrew 	 <p data-bbox="906 1806 1295 1843" style="text-align: center;">North American Least Shrew</p>

- Avg. Total Length: 3 – 3.5”
- Color(s): reddish-brown on top and grayish underside
- Smallest shrew



American Pygmy Shrew

Friends or Foes?

As mentioned before, moles can be considered pests to yards and gardens due to tunneling that could damage or dry out roots and make unsightly molehills. They get a bad reputation, but they are not the real culprits of plant damage. It's the **herbivores**, animals that eat plants, that use their tunnels and damage plants, but the moles get blamed. Moles actually may be helping plants by eating grubs, worms, and other insects that may damage them. A vole, or meadow mouse, is one of those common pests that use mole tunnels to feed on vegetation, but they also dig burrows. Voles look similar to shrews, but they are mouse-like rodents that burrow to feed on grass, plant bulbs, and roots. Because shrews are often mistaken for voles, they also get the blame for damaged yards.